United States
Department of
Agriculture

Forest
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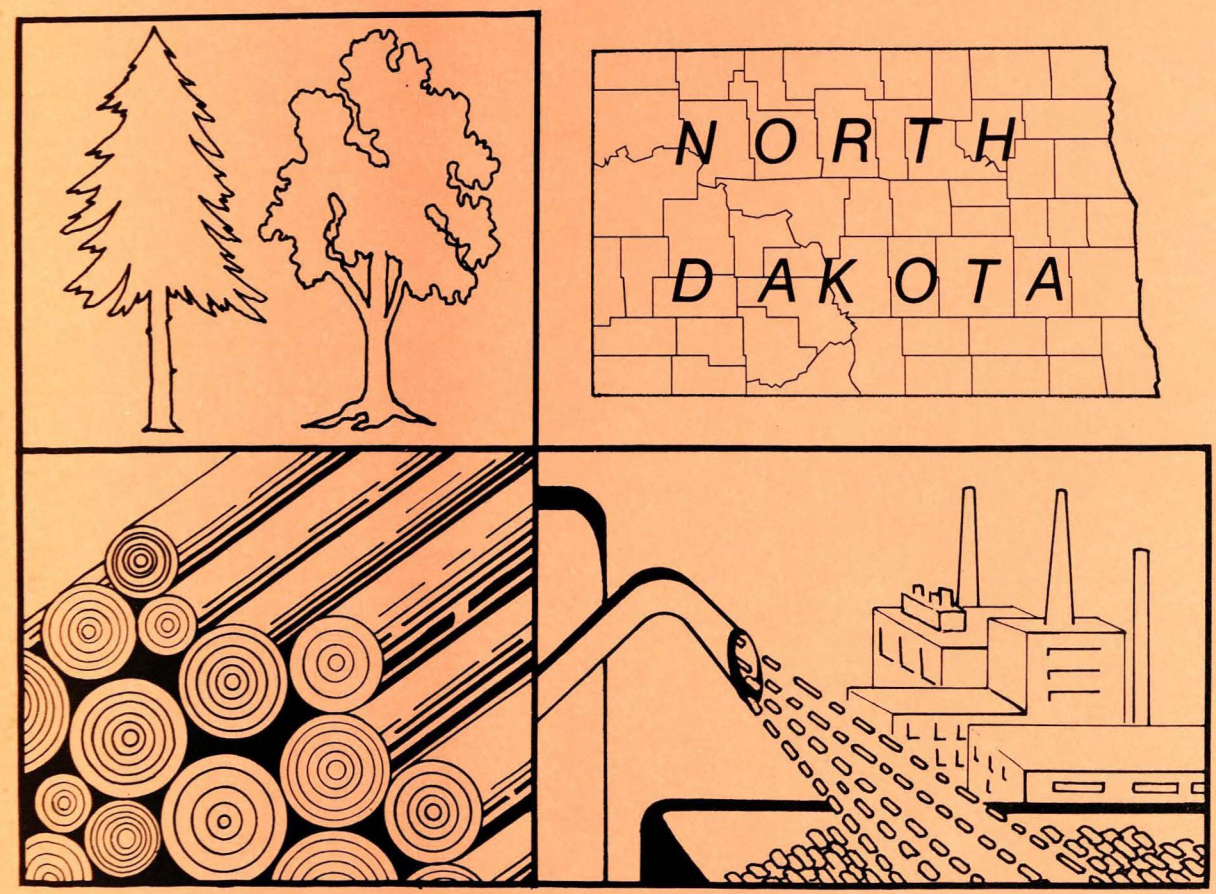
North Central
Forest Experiment
Station

Resource Bulletin
NC-161

North Dakota Timber Industry-An Assessment of Timber Product Output and Use, 1993

Dennis M. May and Robert Harsel



North Central Forest Experiment Station
Forest Service—U.S. Department of Agriculture
1992 Folwell Avenue
St. Paul, Minnesota 55108
Manuscript approved for publication May 18, 1995
1995

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FOREWORD

This bulletin reports findings of a survey of all primary wood-using mills in North Dakota in 1993 and details the industry's size and composition, its use of roundwood, and its generation and disposition of wood residues. Such detailed information is necessary for intelligent planning and decision making in wood procurement, forest resource management, forest industry development, and forest research.

Special thanks are given to the primary wood-using firms that responded to the survey and to the North Dakota Forest Service for canvassing the respondents. Their cooperation is greatly appreciated.

In this bulletin, all volumes are reported in product-specific standard units and/or cubic feet. When necessary, volumes reported by mills in nonstandard units were converted to standard units using regional conversion factors. Reported trends and changes in North Dakota's primary wood-using industry are based on comparisons with previous surveys of the State's primary wood-using industry conducted in 1977 and 1954. Row and column data of tables may not sum due to rounding, but data in each table cell are accurately displayed.

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HIGHLIGHTS

PRIMARY WOOD-USING INDUSTRY

- North Dakota's primary wood-using industry is comprised of 12 mills, 4 more than in 1977. Most of these mills are small sawmills that process less than 50 thousand board feet of saw logs per year (table 1).
- Eight of these mills are located in the eastern tier of counties along the North Dakota-Minnesota border, a shift from 1977 when most of mills were located in the Turtle Mountains area and along the Missouri River Valley.
- In 1993, these 12 mills processed over half a million cubic feet of roundwood into lumber, pallets, planking, and cabin logs (table 2).
- Except for a small volume of cottonwood saw logs imported from Minnesota, all roundwood processed in 1993 was cut from North Dakota's forest lands.

INDUSTRIAL ROUNDWOOD PRODUCTION

- In 1993, 462 thousand cubic feet of industrial roundwood products were cut from North Dakota's forest lands, 3.5 times the level in 1977 and a return to levels of the 1950's (table 3 and fig. 1).

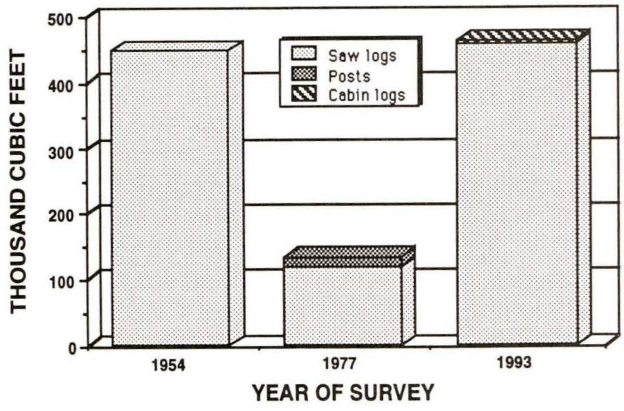

Figure 1.—*Industrial roundwood production by product, North Dakota, 1954-1993.*

- Over the years, saw logs have been the main form of industrial roundwood harvested from North Dakota's forest lands and remain so today. The only other industrial roundwood product cut from the State's forest lands in 1993 was a small volume of ponderosa pine cabin logs harvested from Slope County. Since 1993, however, the State's aspen resource has been increasingly used for reconstituted wood-panel products such as oriented strand board.
- After a severe decline between 1954 and 1977, saw-log production in North Dakota climbed past the level posted in 1954 to exceed 2.6 million board feet in 1993 (table 4 and fig. 2).

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Robert Harsel, Rural Forestry Coordinator, North Dakota Forest Service, received a B.S. degree in forest management and an M.S. degree in business administration from Michigan Technological University. He joined the North Dakota Forest Service in October 1978, and has been assisting with Forest Inventory and Analysis studies for the past 4 years.

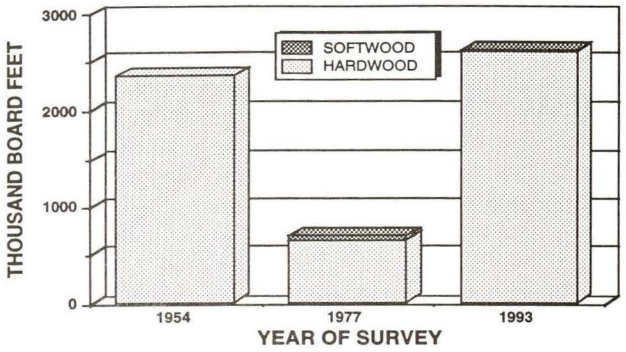

Figure 2.—*Saw-log production by species group, North Dakota, 1954-1993.*

- Since 1977, saw-log production in the State has almost quadrupled, with all of the increase occurring in hardwood species.
- One hardwood species, cottonwood, accounts for 90 percent of all saw logs produced in 1993.
- Most of the State's saw logs are produced in the same eastern tier of counties that contains most of its sawmills.
- Three counties—Cass, Richland, and Traill—account for 71 percent of all saw logs produced in the State.

TIMBER REMOVALS FOR INDUSTRIAL ROUNDWOOD

- In the process of harvesting industrial roundwood, just over 700 thousand cubic feet of woody material were removed from the State's forest lands in 1993.
- Two-thirds of this volume was extracted for use as roundwood products; the rest was left on the ground as harvest residue (tables 5, 6, and fig. 3).
- Of the volume left on the ground, about two-thirds was in tops and cull material (logging slash), and the rest (logging residues) came from the growing-stock portions of live timberland trees.
- As might be expected in an industry dominated by sawmills, removals from sawtimber supplied most of the volume for industrial roundwood products. However, some product volume was still extracted from poletimber and from nongrowing-stock sources such as cull trees and sections, forks and large limbs, stumps, and tops.
- In total, three-quarters of the woody material removed was harvested from growing-stock sources (sawtimber, poletimber, and logging residues).
- Together, industrial roundwood extraction and the resulting generation of logging residues removed 528 thousand cubic feet of growing-stock volume from the State's timberland inventory in 1993 (table 7). In board foot equivalents, 2,632 thousand board feet of this total were removed from the sawtimber portion of the growing-stock inventory (table 8).

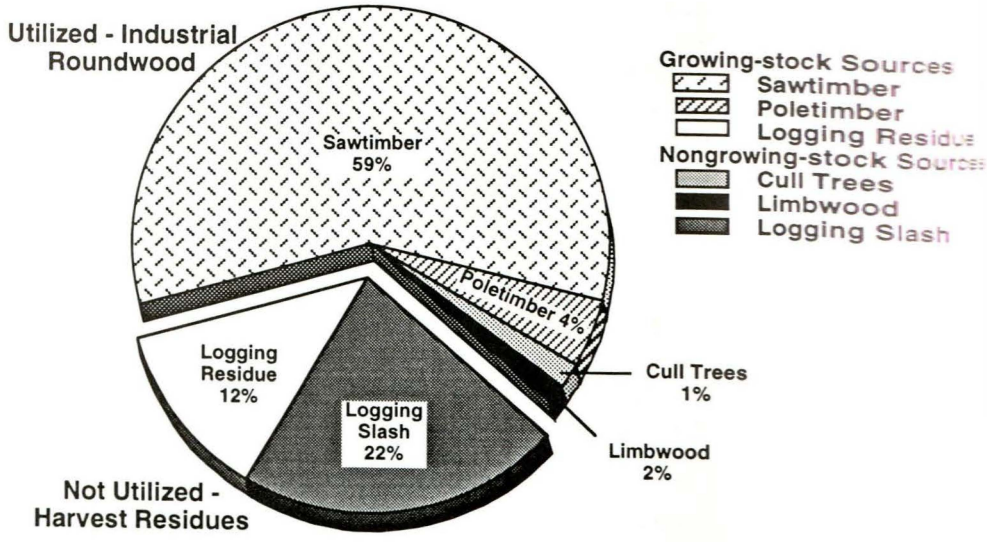

Figure 3.—*Distribution of timber removals for industrial roundwood by source of material, North Dakota, 1993.*

PRIMARY MILL RESIDUES

- In converting industrial roundwood into milled products, the State's primary wood-using industry generated close to 8 thousand green tons of mill residues (table 9).

- Half of this volume was in the form of coarse wood residue, such as slabs and edgings, which is suitable for chipping (table 9 and fig. 4).

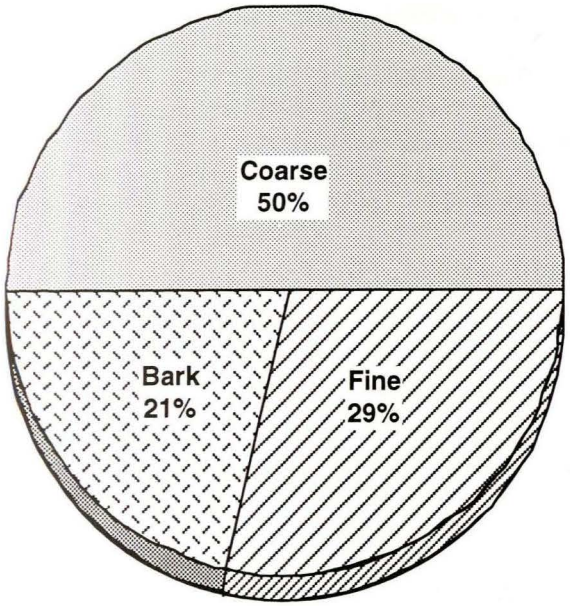

Figure 4.—*Distribution of residues generated by primary wood-using mills by type of residue, North Dakota, 1993.*

- However, without an existing pulpwood market for this potential supply of chips, most of the coarse residue and most of the bark residue were burned as fuel, primarily in domestic settings (fig. 5).

- The bulk of the fine wood residues, such as sawdust and shavings, was used for miscellaneous purposes such as bedding, litter, and mulch.

- Although 12 percent of mill residues generated in the State still remain unused, this is a vast improvement in utilization from 1977 when half of all residues generated went unused.

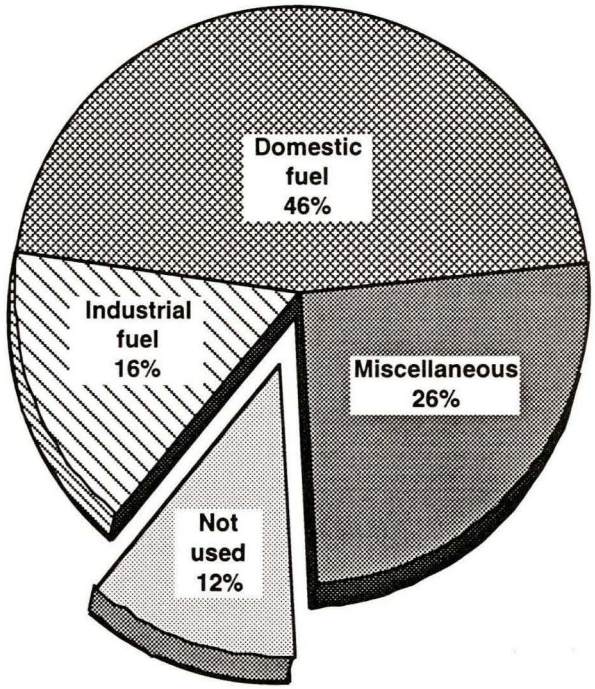

Figure 5.—*Distribution of residues generated by primary wood-using mills by method of disposal, North Dakota, 1993.*

APPENDIX

STUDY METHODS

This study was a cooperative effort of the North Dakota Forest Service (NDFS) and the North Central Forest Experiment Station (NCFES). Using mail questionnaires supplied by NCFES and designed to determine the size and composition of the State's primary wood-using industry, its use of roundwood, and its generation and disposition of wood residues, the NDFS canvassed all primary wood-using mills within the State. The NDFS followed up on nonresponding mills by using additional mailings, telephone, and personal contacts until a 100-percent response was achieved. Completed questionnaires were sent to NCFES for editing and processing.

As part of data editing and processing, all industrial roundwood volumes reported on the questionnaires were converted to standard units of measure using regional conversion factors. Timber removals by source of material and harvest residues generated during logging were estimated from standard product volumes using factors developed from logging utilization studies previously conducted by NCFES. Finalized data on North Dakota's industrial roundwood receipts were loaded into a regional timber removals database and supplemented with data on out-of-State uses of North Dakota roundwood for a complete assessment of North Dakota's timber product output.

DEFINITION OF TERMS

Central stem.—The portion of a tree between a 1-foot stump and the minimum 4.0-inch top diameter outside bark or the point where the central stem breaks into limbs.

Coarse mill residue.—Wood residue suitable for chipping such as slabs, edgings, and veneer cores.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality such as hophornbeam, osage-orange, and redbud.)

Cull removals.—Net volume of rough and rotten trees plus the net volume in sections of the central stem of growing-stock trees that do not meet regional merchantability standards, harvested for industrial roundwood products.

Dead removals.—Net volume of dead trees harvested for industrial roundwood products.

Diameter at breast height (d.b.h.).—The outside bark diameter at 4.5 feet above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Fine mill residue.—Wood residue not suitable for chipping such as sawdust and veneer clippings.

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide.

Growing-stock removals.—The growing-stock volume removed from the timberland inventory by harvesting industrial roundwood products. (Note: Includes sawtimber removals, poletimber removals, and logging residues.)

Growing-stock tree.—A live timberland tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0-inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous.

Harvest residues.—The total net volume of unused portions of trees cut or killed by logging. (Note: Includes both logging residues and logging slash.)

Industrial roundwood products.—Saw logs, pulpwood, veneer logs, poles, commercial posts, piling, cooperage logs, particleboard bolts, shaving bolts, lath bolts, charcoal bolts, and chips from roundwood used for pulp or board products.

Industrial roundwood production.—The quantity of industrial roundwood harvested in a geographic area.

Industrial roundwood receipts.—The quantity of industrial roundwood received by commercial mills in a geographic area.

Limbwood removals.—Net volume of all portions of a tree other than the central stem (including forks, large limbs, tops, and stumps) harvested for industrial roundwood products.

Logging residue.—The net volume of unused portions of the merchantable central stem of growing-stock trees cut or killed by logging.

Logging slash.—The net volume of unused portions of the unmerchantable (nongrowing-stock) sections of trees cut or killed by logging.

Merchantable sections.—Sections of the central stem of growing-stock trees that meet either pulpwood or saw-log specifications.

Net volume.—Gross volume less deductions for rot, sweep, or other defects affecting use for roundwood products.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial roundwood products. Classified in volume tables as rough trees.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 39.9-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, improved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.)

Nonforest land removals.—Net volume of trees on nonforest lands harvested for industrial roundwood products.

Poletimber.—A growing-stock tree at least 5.0 inches d.b.h. but smaller than sawtimber size (9.0 inches d.b.h. for softwoods, 11.0 inches d.b.h. for hardwoods).

Poletimber removals.—Net volume in the merchantable central stem of poletimber trees harvested for industrial roundwood products.

Primary wood-using mills.—Mills receiving roundwood or chips from roundwood for processing into products.

Primary wood-using mill residue.—Wood materials (coarse and fine) and bark generated at manufacturing plants from roundwood processed into principal products. These residues include wood products (byproducts) obtained incidental to production of principal products and wood materials not utilized for some product.

Rotten tree.—A tree that does not meet regional merchantability standards because of excessive unsound cull.

Rough tree.—A tree that does not meet regional merchantability standards because of excessive sound cull. Includes noncommercial tree species.

Roundwood.—Logs, bolts, or other round sections cut from trees (including chips from roundwood).

Sapling.—A live tree between 1.0 and 5.0 inches d.b.h.

Sapling removals.—Net volume in saplings harvested for industrial roundwood products.

Saw-log portion.—That portion of the central stem of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the central stem of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber removals.—As used in table 5, sawtimber removals refers to the net volume in the merchantable central stem of sawtimber trees harvested for industrial roundwood products. (Note: Includes the saw-log and upper-stem portions of sawtimber trees.) When referring to the sawtimber volume removed from the timberland inventory as in table 8, sawtimber removals is the net volume in the saw-log portion of sawtimber trees harvested for roundwood products or left on the ground as harvest residue; it is usually expressed in thousands of board feet (International 1/4-inch rule).

Sawtimber tree.—A growing-stock tree containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h., and hardwoods must be at least 11.0 inches d.b.h.

Sawtimber volume.—Net volume in the saw-log portion of sawtimber trees.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Tree.—A woody plant usually having one or more perennial stems, a more or less definitely formed crown of foliage, and a height of at least 12 feet at maturity.

Timberland.—Forest land that is producing, or is capable of producing, in excess of 20 cubic feet per acre per year of industrial roundwood products under natural conditions; that is not withdrawn from timber utilization by statute or administrative regulation; and that is not associated with urban or rural development.

Upper stem portion.—That portion of the central stem of sawtimber trees between the saw-log top and the minimum top diameter of 4.0 inches outside bark or the point where the central stem breaks into limbs.

COMMON AND SCIENTIFIC NAMES OF TREE SPECIES MENTIONED IN THIS REPORT

SOFTWOODS

Ponderosa pine ..... *Pinus ponderosa*

HARDWOODS

White oak
- Bur oak ..... *Quercus macrocarpa*

Ash
- Black ash (rarely found) ..... *Fraxinus nigra*
- Green ash ..... *Fraxinus pennsylvanica*

Aspen
- Quaking aspen ..... *Populus tremuloides*

Cottonwood
- Eastern cottonwood ..... *Populus deltoides*
- Plains cottonwood ..... *Populus deltoides* var. *occidentalis*

American basswood ..... *Tilia americana*

Elm
- American elm ..... *Ulmus americana*
- Slippery elm (rarely found) ..... *Ulmus rubra*

TABLE TITLES

Table 1.—Number of active primary wood-using mills, North Dakota, 1993

Table 2.—Industrial roundwood receipts by species group and State of origin, North Dakota, 1993

Table 3.—Industrial roundwood production by species group and type of product, North Dakota, 1993

Table 4.—Saw-log production by county and species group, North Dakota, 1993

Table 5.—Timber removals for industrial roundwood by source of material and species group, North Dakota, 1993

Table 6.— Harvest residue generated by industrial roundwood harvesting by county and species group, North Dakota 1993

Table 7.— Growing-stock removals from timberland for industrial roundwood by county and species group, North Dakota, 1993

Table 8.— Sawtimber removals from timberland for industrial roundwood by county and species group, North Dakota, 1993

Table 9.—Residues produced at primary wood-using mills by type of material and type of use, North Dakota, 1993

Table 1.--Number of active primary wood-using mills, North Dakota, 1993

Kind of mill	Number of mills
Sawmills	
1,000 to 5,000 MBF /1	1
50 to 1,000 MBF /1	3
<50 MBF /1	7
Total	11
Other mills	1
Total	12

1/ Thousand board feet per year, International 1/4-inch rule.

Table 2.--Industrial roundwood receipts by species group and State of origin, North Dakota, 1993

(In thousand cubic feet)

Species	Total	Minnesota	North Dakota
SOFTWOODS			
Ponderosa Pine	5	--	5
	5	--	5
HARDWOODS			
Ash	8	--	8
Cottonwood	463	49	413
Aspen	1	--	1
White oak group	13	--	13
Basswood	17	--	17
Elm	5	--	5
Total	507	49	458
Total	511	49	462

Rows and columns may not sum due to rounding.

Table 3.--Industrial roundwood production by species group and type of product, North Dakota, 1993

Species group	Saw logs		Cabin logs	All products
	MBF 1/	MCF 2/	MCF 2/	MCF 2/
SOFTWOODS				
Ponderosa pine	5	1	4	5
Total	5	1	4	5
HARDWOODS				
Ash	48	8	--	8
Cottonwood	2,349	413	--	413
Aspen	3	1	--	1
White oak group	80	13	--	13
Basswood	96	17	--	17
Elm	29	5	--	5
Total	2,605	458	--	458
All species	2,610	458	4	462

1/ Thousand board feet, International 1/4-inch rule.

2/ Thousand cubic feet.

Rows and columns may not sum due to rounding.

Table 4.--Saw-log production by county and species group, North Dakota,1993

(In thousand board feet) 1/

County	Ponderosa pine	Total softwoods	Ash	Cottonwood	Aspen	White oak group	Basswood	Elm	Total hardwoods	All species
Barnes	--	--	--	6	--	3	3	--	11	11
Bottineau	--	--	--	--	2	--	--	--	2	2
Burke	--	--	--	5	--	--	--	--	5	5
Cass	--	--	40	567	--	40	--	20	667	667
Grand Forks	--	--	--	100	--	--	--	--	100	100
Morton	--	--	1	8	--	--	--	1	10	10
Pembina	--	--	8	122	1	36	92	6	265	265
Ransom	--	--	--	166	--	--	--	--	166	166
Richland	--	--	--	577	--	1	2	1	581	581
Sargent	--	--	--	100	--	--	--	--	100	100
Slope	5	5	--	--	--	--	--	--	--	5
Steele	--	--	--	100	--	--	--	--	100	100
Traill	--	--	--	598	--	--	--	--	598	598
Total	5	5	48	2,349	3	80	96	29	2,605	2,610

1/ International 1/4-inch rule.

Rows and columns may not sum due to rounding.

Table 5.--Timber removals for industrial roundwood by source of material and species group, North Dakota,1993

(In thousand cubic feet)

Species group	Growing stock				Nongrowing stock							Total material used for products	Harvest residue	Total material harvested
	Used for products				Used for products									
	Saw-timber	Pole-timber	Logging residue	TOTAL	Limb-wood	Sap-lings	Cull trees	Dead trees	Nonforest trees	Logging slash	TOTAL			
SOFTWOODS														
Ponderosa Pine	4.7	0.1	0.1	4.9	0.1	--	*	--	--	1.5	1.5	4.8	1.6	6.4
Total	4.7	0.1	0.1	4.9	0.1	--	*	--	--	1.5	1.5	4.8	1.6	6.4
HARDWOODS														
Ash	7.9	--	1.2	9.1	0.1	--	0.2	--	--	1.8	2.1	8.1	3.0	11.1
Cottonwood	370.2	24.0	78.9	473.1	11.0	--	8.2	--	--	140.5	159.7	413.4	219.4	632.8
Aspen	0.4	0.1	--	0.6	--	--	--	--	--	0.1	0.1	0.6	0.1	0.6
White oak group	13.0	--	1.9	15.0	0.1	--	0.3	--	--	3.0	3.4	13.4	4.9	18.4
Basswood	15.2	1.0	3.2	19.4	0.5	--	0.3	--	--	5.8	6.5	16.9	9.0	25.9
Elm	4.5	0.3	1.0	5.8	0.1	--	0.1	--	--	1.7	2.0	5.0	2.7	7.7
Total	411.2	25.4	86.2	522.8	11.8	--	9.1	--	--	152.8	173.8	457.5	239.0	696.6
All species	415.9	25.5	86.3	527.7	11.8	--	9.2	--	--	154.3	175.3	462.3	240.6	703.0

Rows and columns may not sum due to rounding.

* Less than 500 cubic feet.

Table 6.--Harvest residue generated by industrial roundwood harvesting by county and species group, North Dakota, 1993

(In thousand cubic feet)

County	Ponderosa pine	Total softwoods	Ash	Cottonwood	Aspen	White oak group	Basswood	Elm	Total hardwoods	All species
Barnes	--	--	--	1	--	*	*	--	1	1
Bottineau	--	--	--	--	*	--	--	--	*	*
Burke	--	--	--	*	--	--	--	--	*	*
Cass	--	--	2	53	--	2	--	2	60	60
Grand Forks	--	--	--	9	--	--	--	--	9	9
Morton	--	--	*	1	--	--	--	*	1	1
Pembina	--	--	*	11	*	2	9	1	23	23
Ransom	--	--	--	16	--	--	--	--	16	16
Richland	--	--	--	54	--	*	*	*	54	54
Sargent	--	--	--	9	--	--	--	--	9	9
Slope	2	2	--	--	--	--	--	--	--	2
Steele	--	--	--	9	--	--	--	--	9	9
Traill	--	--	--	56	--	--	--	--	56	56
Total	2	2	3	219	*	5	9	3	239	241

* Less than 500 cubic feet.

Rows and columns may not sum due to rounding.

Table 7.--Growing-stock removals from timberland for industrial roundwood by county and species group, North Dakota,1993

(In thousand cubic feet)

County	Ponderosa pine	Total softwoods	Ash	Cottonwood	Aspen	White oak group	Basswood	Elm	Total hardwoods	All species
Barnes	--	--	--	1	--	*	1	--	2	2
Bottineau	--	--	--	--	*	--	--	--	*	*
Burke	--	--	--	1	--	--	--	--	1	1
Cass	--	--	7	114	--	7	--	4	133	133
Grand Forks	--	--	--	20	--	--	--	--	20	20
Morton	--	--	*	2	--	--	--	*	2	2
Pembina	--	--	1	25	*	7	18	1	53	53
Ransom	--	--	--	33	--	--	--	--	33	33
Richland	--	--	--	116	--	*	*	*	117	117
Sargent	--	--	--	20	--	--	--	--	20	20
Slope	5	5	--	--	--	--	--	--	--	5
Steele	--	--	--	20	--	--	--	--	20	20
Traill	--	--	--	120	--	--	--	--	120	120
Total	5	5	9	473	1	15	19	6	523	528

* Less than 500 cubic feet.

Rows and columns may not sum due to rounding.

* U.S. GOVERNMENT PRINTING OFFICE: 1995-658-152/20

Table 7.--Growing-stock removals from timberland for industrial roundwood by county and species group, North Dakota, 1993

(In thousand cubic feet)

County	Ponderosa pine	Total softwoods	Ash	Cottonwood	Aspen	White oak group	Basswood	Elm	Total hardwoods	All species
Barnes	--	--	--	1	--	*	1	--	2	2
Bottineau	--	--	--	--	*	--	--	--	*	*
Burke	--	--	--	1	--	--	--	--	1	1
Cass	--	--	7	114	--	7	--	4	133	133
Grand Forks	--	--	--	20	--	--	--	--	20	20
Morton	--	--	*	2	--	--	--	*	2	2
Pembina	--	--	1	25	*	7	18	1	53	53
Ransom	--	--	--	33	--	--	--	--	33	33
Richland	--	--	--	116	--	*	*	*	117	117
Sargent	--	--	--	20	--	--	--	--	20	20
Slope	5	5	--	--	--	--	--	--	--	5
Steele	--	--	--	20	--	--	--	--	20	20
Traill	--	--	--	120	--	--	--	--	120	120
Total	5	5	9	473	1	15	19	6	523	528

* Less than 500 cubic feet.

Rows and columns may not sum due to rounding.

Table 9.--Residues produced at primary wood-using mills by type of material and type of use, North Dakota,1993

(In thousand tons, green weight)

	Wood residue							
	Total		Coarse 1/		Fine 2/		Bark	
Type of use	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
Industrial fuel	--	0.93	--	0.93	--	--	--	0.33
Domestic fuel	0.01	2.59	0.01	2.58	--	0.02	0.02	1.00
Miscellaneous 3/	--	2.03	--	--	--	2.03	--	*
Not used	0.02	0.60	--	0.38	0.02	0.22	--	0.32
Total	0.03	6.16	0.01	3.89	0.02	2.27	0.02	1.66

1/ Suitable for chipping such as slabs,edgings,veneer cores, etc.

2/ Not suitable for chipping such as sawdust,veneer clippings,etc.

3/ Livestock bedding, mulch, small dimension, and specialty items.

* Less than 500 green tons.

Rows and columns may not sum due to rounding.

May, Dennis M.; Harsel, Robert.
1995. **North Dakota timber industry—an assessment of timber product output and use, 1993**. Resour. Bull. NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 14 p.

Reports findings of a survey of all primary wood-using mills in North Dakota in 1993 and compares those findings with earlier surveys. Production and receipts of industrial roundwood are reported by product, species, and county. Also reports the quantity, type, and disposition of wood and bark residues generated by North Dakota's primary wood-using industry.

KEY WORDS: Bark, mill, production, roundwood, residues, saw logs.

Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.